Roll No. | | | | | | | | | | |

S. No. of Question Paper : **347**

Unique Paper Code : **235651**   **G**

Name of the Paper : **Numerical Analysis and Statistics**

Name of the Course : **B.A. (Prog.) Discipline Course**

Semester : **VI**

Duration : **3 Hours**   Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

This question paper has *six* questions in all.

Attempt any *two* parts from each question.

All questions are compulsory.

Use of scientific calculator is allowed.

Candidate can ask for log/statistical table.

1.   (*a*)   (*i*)   Perform three iterations by Bisection method to obtain the smallest positive root of the equation :

$$f(x) = x^3 - x - 4 = 0.$$

P.T.O.

3. (a) Find the unique polynomial of degree 2 or less such that :

$$f(1) = 1, f(3) = 27, f(4) = 64,$$

using Lagrange interpolating formula. Estimate $f(2)$. 6½

(b) For the following data :

$$f(0) = 1, f(1) = 14, f(2) = 15,$$

$$f(4) = 5, f(5) = 6, f(6) = 19$$

Obtain the polynomial using Newton divided difference interpolation. Estimate $f(3)$. 6½

(c) If

$$f(x) = 1/x,$$

find the divided difference $f[x_1, x_2, x_3, x_4]$. 6½

4. (a) Calculate the coefficient of correlation from the following observations : 6

X	Y
2.52	550
2.49	610
2.47	730
2.42	870
1.69	880
3.43	930
4.72	400

(b) Determine the line of regression of Y on X for the following data : 6

X	Y
65	67
66	68
67	65
67	68
68	72
69	72
70	69
72	71

(ii) If a root of $f(x) = 0$ lies in the interval (a, b), then what is minimum number of iterations required when the permissible error is ε.   6

(b) A real root of the equation :

$$f(x) = x^3 - 5x + 1 = 0.$$

lies in the interval $(0, 1)$. Perform four iterations of Secant method to obtain this root.   6

(c) Perform five iterations by Newton-Raphson method to find the root of $N^{\frac{1}{2}}$, where $N = 17$. Take initial approximation $x_0 = 3$.   6

2. (a) Consider the system of equations :

$$\begin{bmatrix} 1 & -a \\ -a & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix}$$

where a is a real constant. For which values of a the Gauss-Seidel method converges.   6

find the probability that a random sample of pages will contain no error.

(Given, $e^{-0.75} = 0.473$).   6½

(b) If X is a normal variate with mean 30 and S.D. 5. Find the probabilities that :   6½

(i) $26 \leq X \leq 40$

(ii) $X \geq 45$.   6½

(c) Determine the moment generating function of Binomial distribution.   6½

(c) Let the pmf $p(x)$ be positive at $x = -1, 0, 1$ and zero elsewhere. If

$$p(0) = \frac{1}{4} \text{ and if } E(X) = \frac{1}{4},$$

determine $p(-1)$ and $p(1)$.   6

5. (a) Let X have the pdf

$$f(x) = \frac{1}{x^2},\ 1 < x < \infty,$$

zero elsewhere. Show that $E(X)$ does not exist.   6½

(b) Let X be a random variable such that

$$E[(X - b)^2]$$

exists for all real b. Show that

$$E[(X - b)^2]$$

is minimum when $b = E(X)$.   6½

(c) Determine the mode of normal distribution.   6½

6. (a) In a book of 520 pages, 390 typo-graphical errors occur. Assuming Poisson law for the number of error per page,

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(b) Solve the following system of equations :

$$2x_1 + x_2 + x_3 - 2x_4 = -10$$

$$4x_1 + 0x_2 + 2x_3 + x_4 = 8$$

$$3x_1 + 2x_2 + 2x_3 + 0x_4 = 7$$

$$x_1 + 3x_2 + 2x_3 - x_4 = -5$$

Using the Gauss-elimination method with partial-pivoting.   6

(c) For the following system of equations :

$$-3x_1 + x_2 + 0x_3 = -2$$

$$2x_1 - 3x_2 + x_3 = 0$$

$$0x_1 + 2x_2 - 3x_3 = -1$$

(i) Show that Jacobi iteration scheme converges.

(ii) Starting with $X^0 = [0, 0, 0]^T$, iterate three times.   6